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A NEW TRAPPING FACILITY FOR PRECISION EXPERIMENTS ON LOW ENERGY BEAM

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A high precision measurement facility using recent ion cooling and trapping techniques has been designed by the LPC to fully exploit the potential of the GANIL radioactive low energy beam. Two complementary trapping devices have been developed at the LPC.

- First, a Radio Frequency Quadrupole Cooler Buncher[1] (RFQCB) was designed to handle beams with high emittance, such as those from ECR sources (100 π mm mrad at 35 keV). This RFQCB should allow to cool and bunch beams of low mass ions like He^+, using Hydrogen as a buffer gas.
- Secondly, a transparent Paul Trap has been built to store and study the ion bunches with reduced emittance provided by the RFQCB.

Such development was first motivated by precision experiments on nuclear beta decay. The β – ν angular correlation parameter in nuclear beta decay is sensitive to the possible existence of exotic currents, not predicted by the *V-A* theory. In the case of ^{6}He decay, a deviation from the Standard value would imply the existence of tensor currents, mediated by new gauge bosons, the so-called *leptoquarks* [2]. In this precision experiment, the radioactive ions will be stored nearly at rest in a thin volume defined by the electric field of the transparent Paul Trap [3]. This will allow the measurement of the β – recoil ion coincidence spectrum in the center of mass of the decaying ions (figure 1). In a second time, many other experiments, especially in atomic physics, could take advantage of such a radioactive ions trapping facility.

First tests of the RFQCB have been performed with an off-line thermo-ionic source and an ECR source on the LIMBE facility at CIRIL, where the cooling of He^+ and of heavier ions could be achieved. In addition, bunches of ions extracted from the RFQCB have been injected and stored for more than 100 ms in the transparent Paul Trap. The detailed features and performances of those trapping devices will be presented at the conference.

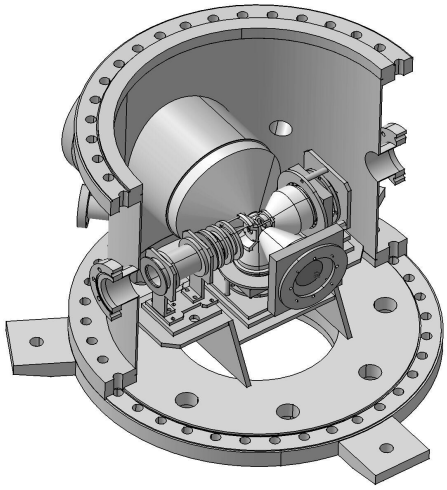

Figure 1: The Transparent Paul Trap surrounded by the recoil ion and β detectors

References

[1]: G. Darius et al, APAC2001, Aahrus, proceedings to be published

[2]: P. Hergzeg, in *Precision Tests of the Standard Electroweak Model*, World Scientific, 1998, p.786

[3]: P. Delahaye et al., Hyperfine Interactions, **132(**2001)479